[Aim: 100/100 in Maths]

STATISTICS

9th → ungrouped data ⇒ 6, 7, 9, 14, 2

Grouped Data

Exclusive

Class Interval

0 - 10
10 - 20
20 - 30
30 - 40

Upper limit (U.L)

lower limit (l.l.)

Not in syllabus

Inclusive

Class Interval

1 - 10
11 - 20
21 - 30
31 - 40

-0.5

+0.5

convert

Exclusive

0.5 - 10.5
10.5 - 20.5
20.5 - 30.5
30.5 - 40.5

Class size (h) = UL - LL

MEAN ($\bar{x}$)

Direct Method

① Calculate $x_i = \frac{UL + LL}{2}$

② $f_i x_i$

③ $$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

Assumed Mean Method

① $x_i = \frac{UL + LL}{2}$

② $d_i = x_i - a$

③ $f_i d_i$

④ $$\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

Step-deviation Method

① x_i

② d_i

③ $u_i = \frac{d_i}{h}$

④ $f_i u_i$

⑤ $$\bar{x} = a + \left(\frac{\Sigma f_i u_i}{\Sigma f_i}\right) h$$

#LP:- Find the mean of the following data: (Direct Method)

Class Interval	freq (f_i)	$x_i = \frac{UL+LL}{2}$	$f_i x_i$
15-25	6	$\frac{15+25}{2} = 20$	120
25-35	11	$\frac{25+35}{2} \Rightarrow 30$	330
35-45	7	40	280
45-55	4	50	200
55-65	4	60	240
65-75	2	70	140
75-85	1	80	80
	35		1390

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

$$\bar{x} = \frac{1390}{35}$$

#LP:- Find the mean of the following data: [Assumed Mean Method]

Class Interval	freq (fi)	$x_i = \frac{u+l}{2}$	$d_i = x_i - a$ (a = M.T)	$f_i d_i$
15-25	6	20	-30	-180
25-35	11	30	-20	-220
35-45	7	40	-10	-70
45-55	4	50 ← a	0	0
55-65	4	60	10	40
65-75	2	70	20	40
75-85	1	80	30	30
	35			-360

$$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

$$= 50 + \frac{(-360)}{35}$$

$$\Rightarrow \frac{1750 - 360}{35}$$

$$\bar{x} \Rightarrow \frac{1390}{35}$$

#LP:- Find the mean of the following data: [Step deviation Method]

Class Interval	freq	x_i	$d_i = x_i - a$	$u_i = \frac{d_i}{h}$	$f_i u_i$
15-25	6	20	-30	$\frac{-30}{10} = -3$	-18
25-35	11	30	-20	-2	-22
35-45	7	40	-10	-1	-7
45-55	4	50 → a	0	0	0
55-65	4	60	10	1	4
65-75	2	70	20	2	4
75-85	1	80	30	3	3
	35				-36

$h = 25 - 15 = 10$

$$\bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i}\right) h$$

$$= 50 + \left(\frac{-36}{35}\right) 10$$

$$\Rightarrow 50 - \frac{360}{35}$$

$$\Rightarrow \frac{1750 - 360}{35}$$

$$\bar{x} = \frac{1390}{35}$$

LP:- Find 'k' if mean of the following distribution is 53.

Class	freq. f_i	$x_i = \frac{UL+LL}{2}$	$d_i = x_i - a$	$u_i = \frac{d_i}{h}$	$f_i u_i$
0-20	12	10	-40	-2	-24
20-40	15	30	-20	-1	-15
40-60	32	50 ← a	0	0	0
60-80	k	70	20	1	k
80-100	13	90	40	2	26
	72+k				k-13

$h = UL - LL$

$\Rightarrow 20 - 0 \Rightarrow 20$

$\bar{x} = 53$

$a + \left(\frac{\Sigma f_i u_i}{\Sigma f_i}\right) h = 53$

$50 + \left(\frac{k-13}{72+k}\right) 20 = 53$

$\left(\frac{k-13}{k+72}\right) 20 = 3$

$20k - 260 = 3k + 216$

$k = 28$

Q1:- If the mean is 1.46, find missing frequencies:-

No. of accidents (x)	frequency (f_i)	$f_i x_i$
0	46	0
1	? → p	p
2	? → q	2q
3	25	75
4	10	40
5	5	25
Total	200	140+p+2q

$46+p+q+25+10+5=200$ — (1)

$\bar{x}=1.46$

$\frac{\Sigma f_i x_i}{\Sigma f_i} = 1.46$

$\frac{140+p+2q}{200} = 1.46$

$140+p+2q = 1.46 \times 200$

$140+p+2q = 292$

$p+2q = 292-140$

$p+2q = 152$ — (1)

MEDIAN

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) h$$

l = lower limit of median class

n = no. of observations

cf = cumulative freq. of class preceding median class

f = freq. of median class

#LP :- Monthly consumption of 68 consumers are given. Find median

Monthly consumption	no. of consumers (f_i)	c.f.
65-85	4	4
85-105	5 +	9
105-125	13 +	22 → cf
125-145 (median class)	20 + → f	42
145-165	14 +	56
165-185	8 +	64
185-205	4 +	68

$n = 68$

$h = 85 - 65$

$h = 20$

① calculate c.f. of all

② $\frac{n}{2} = \frac{68}{2} = 34$

③ 34 से just बड़ा cf कौनसा avl.

→ इसके corr. class is median class

$l = 125$

$n = 68$

$f = 20$

$cf = 22$

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) h \Rightarrow 125 + \left(\frac{34 - 22}{20}\right) 20$$

$\Rightarrow 125 + 12$

$\Rightarrow 137$

#UP: Find median :- (Total of 100 policy holders)

Age	No of policy holders	cf
Below 20	2	
Below 25	6	
Below 30	24	
Below 35	45	cf
Below 40	78	
Below 45	89	
Below 50	92	
Below 55	98	
Below 60	100	

less than upty

f	CI
2	Below 20
4	20-25
18	25-30
21	30-35
33	35-40
11	40-45
3	45-50
6	50-55
2	55-60

f

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) h$$

$\frac{n}{2} = \frac{100}{2} = 50$

$l = 35$

$n = 100$

$f = 33$

$cf = 45$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) h$$

Mode

Class	f
0-20	6
20-40	8
40-60	10
60-80 (modal class)	12
80-100	6
100-120	5
120-140	3

f_0, f_1, f_2

l = 60

$h = 71 - 71 = 20 - 0 = 20$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) h$$

l = lower limit of modal class

? ? → highest freq. & corr. class

3 Median = 2 Mean + Mode

#LP :- Given, Mode = 2

Mean = $\frac{1}{2}$

Median = ??

3 Median = 2 mean + mode

$3M = 2\left(\frac{1}{2}\right) + 2$

$3M = 3$

$M = 1$